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October 3-6, 2010  
Corning, New York, U.S.A.*

# GLASS & CERAMICS CONSERVATION

# 2010

Hannelore Roemich  
*Editorial Coordinator*



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**Cover Image:**

*Cire perdue* figure made by Frederick Carder in the 1930s or 1940s, with a repair in which the epoxy is badly yellowed. The Corning Museum of Glass (59.4.426).

# Hatching a Theory of Attribution: A 15th-Century Madonna and Child at the National Gallery of Art

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## Abstract

Previous discussion of the Kress Madonna at the National Gallery of Art, Washington, D.C., has been limited to its stylistic qualities with respect to the question of attribution. The major treatment and in-depth technical study currently under way add a new dimension to the debate by looking at the materials and techniques used in the creation of the sculpture.

*Keywords: terracotta, polychrome sculpture, Madonna and Child*

## Introduction

At first glance, the gilded polychrome terracotta Madonna and Child at the National Gallery of Art in Washington, D.C., formerly attributed to Lorenzo Ghiberti, appears to be similar to any one of the many produced during the Renaissance. The extensive gilding and punched decoration, the finely painted details, and the unique construction method, however, make it clear that this work is anything but ordinary. Similarly, the inscription on its base seems quite common until a more careful reading reveals a subtle anomaly. A treatment and technical study of the Kress Madonna, as the sculpture is also known, were begun in 2007, with the goal of contributing to a greater understanding of the work by looking at the materials used and the technique employed in its manufacture. This paper will summarize the treatment and will report findings from the technical investigation.

## The Sculpture and Its Context

In 14th- and 15th-century Tuscany, representations of the Madonna and Child were highly popular, thanks in large part to the teachings of the Dominican monk Beato Giovanni Dominici (1355–1419), who extolled the virtues of such images and their benefits for family life (Dominici 1860, p. 131). In addition to being a visual reminder of ideal familial behavior, the images served as objects of personal devotion.

Increased demand for such images led to their production on a large scale in terracotta and plaster (relatively



Figure 1  
Madonna and Child. H. 102.5 cm, W. 62.2 cm, D. 28.3 cm.  
National Gallery of Art, Washington, D.C., Kress Collection  
(1943.4.93). (Photo: National Gallery of Art)

inexpensive media), making them accessible to the general public. The most popular designs were reproduced seemingly by the hundreds, judging by the number of surviving examples (Jolly 1998, pp. 94–95). While most of the extant examples are somewhat smaller than the National Gallery’s Kress Madonna (Fig. 1), there are others of similar dimensions. The size and hand-modeling, the exquisite gilding with punchwork and delicately painted details, together with the inscription and wooden backing, render this work unique among the many of its kind, and suggest an important commission for a wealthy patron.

The half-length Madonna and the full-length Child, modeled in three-quarter round, rest on a rectangular self-base with the sgraffito inscription “AVE MARIA GRAZIA PRENA [*sic*].” The Madonna’s blue-lined gilded cloak and

veil are embellished with floral and geometric punched decoration; incised lines across her chest and shoulders denote the edge of her veil and define it as separate from the mantle. Single brush lines delineate the eyes, eyebrows, and individual strands of hair. Rings are painted on the Madonna’s left fifth digit and right third digit, and vestiges of another ring on the right fourth digit are visible under magnification. A necklace of red and black beads is painted around the Child’s neck, and traces of a pendant are visible around a large iron nailhead. The painted pendant may have been conceived as a way of disguising the projection created by the nailhead below the surface of the polychromy. Other nailheads are visible throughout, and, as will be discussed later, their presence is significant.

The reverse is formed primarily by a single wooden panel shaped to the terracotta (Fig. 2) and attached to it, after firing, by means of long iron nails. No other terracotta sculpture with a wooden backing has been identified,



Figure 2  
Madonna and Child, reverse. (Photo: National Gallery of Art)

and thus its existence here is quite noteworthy. A substantial crossbar is nailed horizontally across the lower half of the panel. Just below, modern flat-head screws secure an additional block of wood—a later addition intended to balance and stabilize the sculpture. A swath of a slightly different color and texture is present across the backing just above the midpoint (Penny 2007), and it may indicate the site where the sculpture rested against a support in its original location, protecting this area from wear.

### Attribution

Despite considerable attention by art historians, the work remains unattributed, and its origin is unknown. The sculpture is said to have adorned the Church of Santo Spirito in Florence (Bange 1929; Duveen 1944; Seymour 1949, p. 174). However, a fire in 1471 leveled the church, and “all the altars, panel paintings, crucifixes, and images of devotion” were lost (Capretti 1991).

Renowned early 15th-century artists such as Lorenzo Ghiberti (Bode 1928, pp. 61–70; Seymour 1949, p. 174), Donatello (Gentilini 2008), Jacopo della Quercia (Krautheimer 1936), Nanni di Bartolo (Planiscig 1930, p. 82), and Antonio Federighi (del Bravo 1970, pp. 74–75; Natali 1974) have been suggested. John Pope-Hennessy and Ulrich Middeldorf proposed the more reserved attribution of “Florentine” (Pope-Hennessy 1955, pp. 215–216; Middeldorf 1976, pp. 13–14). Comparisons with the work of Luca della Robbia and Michelozzo have also been drawn.

Attribution is particularly challenging because all of the artists mentioned above were more or less contemporaries, often collaborating on projects, and thus they must have influenced one another’s work. In creating such pieces, sculptors often worked with painters for application of the gilding and polychromy. In his 15th-century *Le ricordanze*, the painter Neri di Bicci notes several stone, terracotta, and plaster sculptures that he was commissioned to paint or gild (di Bicci 1976). On at least one occasion—the Annunciation group in San Gimignano—the Sieneese Martino di Bartolomeo di Biago signed sculpture he painted for Jacopo della Quercia.

The lack of definitive stylistic qualities or concrete documentation with which to attribute the sculpture convincingly to any one specific artist led the National Gallery in

1976 to officially change the attribution from “Lorenzo Ghiberti” to “Florentine, circa 1425.”

### Treatment and Technical Study

Beginning in 2007, a full conservation treatment and technical investigation of the sculpture were undertaken. A heavy layer of dirt darkened the surface of the sculpture overall, masking the fine detail in the gilding as well as the extent of loss to the polychromy. Multiple past treatment campaigns are evident throughout, and they include areas of structural repair, consolidation, fills, and inpainting. These treatments were carried out before the current Conservation Department at the National Gallery of Art was established, and very little documentation exists. A note in the curatorial file states that the sculpture was “cleaned and restored by M. Modestini 1955,” but no further information is included.

The Child’s head has been reattached. Although there are original repairs to firing cracks in other areas, the presence of fill material over polychromy in this area indicates that the head repair is not original. Ultraviolet illumination helped to distinguish additional areas of past intervention, and Fourier transform infrared spectroscopy (FTIR) was used to identify some of the fills and inpainting media used, which included beeswax and poly(vinyl acetate) (Lomax 2008). FTIR was also used to characterize the accumulated surface dirt. The results ruled out the presence of an original applied coating and helped to guide a cleaning strategy. A solution of equal parts deionized water, ethanol, and acetone was found to be effective overall, while in some areas, saliva and a solution of Surfonic JL-80N in deionized water, alone or in combination with each other, were found to be most effective (Fig. 3). Previous inpainting, which had been toned to the dirty surface and no longer matched the newly cleaned surface, was removed. Disfiguring fills were also removed, although wax fills in the Madonna’s mantle were retained because their removal would compromise the surrounding original material.

At the time of this writing, treatment is in progress. Following the stabilization of a crack across the lower proper right edge of the Madonna’s mantle and consolidation of ground delaminating from the terracotta, areas of loss to the polychromy will be inpainted to complement the surrounding original material. Most areas where the



Figure 3  
Detail, during removal of surface dirt.  
(Photo: National Gallery of Art)



Figure 4  
During treatment, detail of Child's left leg, showing parallel shading marks. (Photo: author)

terracotta is exposed will not be filled, since they do not detract from one's appreciation of the work.

When the surface dirt was removed, an intriguing series of fine lines came to light. These lines are clearly evident on the interior of the Child's left leg (Fig. 4), and, upon close examination, they are also visible in other areas, such as the underside of the Madonna's right hand and the Child's back and shoulders. All of the lines are painted as single dark brown or black parallel strokes, and they are present only in the flesh-toned portions. Their placement seems to have been aimed at accentuating the three-dimensionality of the figures, similar to the way in which hatch marks create depth in a two-dimensional representation such as a print or a painting. This feature may prove to be an important clue in identifying the artist or workshop, if other polychrome terracotta sculpture with similar marks and a firm attribution can be found.

Based on data gathered during the treatment and investigation, a possible construction method of the sculpture can be suggested. As was common practice, the piece was probably built up and finished on a wooden support, with several pieces of paper between the clay and the board (Rees-Jones 1978, p. 99). The paper acted as a separator, aiding in the removal of the sculpture from the board when the clay was leather-hard. Excess clay was removed from the reverse to minimize the possibility of cracking or breakage during firing. Indeed, tool marks and fingerprints are readily visible on the interior of the work. Presumably the holes for the nails were also made at this time. The rounded edges of one of the nail holes, visible through the opening in the backing, indicate that the holes were made while the clay was still moist. This critical detail establishes that the wood backing is original to the sculpture, and that it was part of the artist's fundamental

conception of the work and not an afterthought to rectify a firing accident.

The purpose of the backing, however, remains unknown. One explanation is that it played a specific role in the sculpture's original setting. The art historian Giancarlo Gentilini proposes a different theory, noting that, in the early 15th century, terracotta sculpture was not yet as popular or as common as it would become in the following decades. He thinks that the wooden backing may have made the sculpture seem familiar and acceptable to the patron, who would have been accustomed to the more prevalent wood polychrome sculpture of the time (Gentilini 2008). The presence of wooden edging around the base and of an additional wooden panel across the underside supports this novel idea.

Thermoluminescence analysis of the clay placed the last firing roughly between 1400 and 1650 (Stoneham 2007), confirming the authenticity of the sculpture. Silicon dioxide and aluminum oxide were identified as the principal components of the clay through X-ray diffraction (Douglas 2007) and electron-beam microprobe analysis (Lange 1998). Scanning electron microscopy shows a heterogeneous mixture, with particles ranging in size from approximately one to 20 micrometers (Palmer 2009). The overall thickness of the clay wall is difficult to measure because of the presence of the wood backing, but in the area that is accessible through the large vertical crack in the wood panel, it measures approximately 12 millimeters.

After firing, the terracotta and the wooden backing were joined by means of iron nails, inserted through the pre-made holes in the terracotta and into the 3.8 centimeters-thick poplar (Palmer 2007) panel. Poplar, still plentiful in Italy, was commonly employed in the fabrication of panels for paintings. The wooden edging and the panel on the underside of the base would also have been applied after firing, before the linen strip was applied over the terracotta/wood seams.

Linen, identified using transmitted light microscopy, is present along the length of the join between the terracotta and the wood, as well as over the seams between the edging and the base. Its presence here recalls the technique used for the construction of large panel paintings, and of the background panel in Donatello's plaster relief *Madonna dei Cordai*. In that work, the seams between the four poplar boards are overlaid with strips of linen (Kumar



Figure 5

Detail showing continuation of terracotta fold, in cloth, onto edge of wooden backing. Arrows point to exposed textile; the dotted line indicates the terracotta/wood boundary. (Photo: author)

and Sisi 1986, p. 10). Textile is also found in the National Gallery terracotta where a fold in the mantle at the Madonna's right shoulder meets the wooden panel. The fold is built up in cloth, extending it visually and physically onto the edge of the panel (Fig. 5).

Samples of the gilding and polychromy were examined in cross section to determine the stratigraphy of the surface treatments as well as to provide additional information on the materials present. The results showed a structure consistent with other polychrome sculpture from the Renaissance, and revealed that no additional pigment or gilding layers are present over the original. This is a somewhat remarkable feature, since owners often repainted religious sculpture, whether out of respect for the image or simply to modernize it.

A glue size was used to seal the surface of the terracotta before the preparation layer was applied, and it is visible in the cross sections. The ground was applied in two stages, with the lower one coarser than the finer upper layer (Palmer 2009). Such a layering structure is consistent with Cennino Cennini's account from about 1390 of the use of *gesso grosso* and *gesso sottile* in panel painting (Cennini 1859, chaps. 15–18), as well as with findings in other polychrome sculpture from the Renaissance. The ground



Figure 6

Detail of the inscription. (Photo: author)

on the Kress Madonna was identified as calcium sulfate anhydrite (Douglas 2007) and dihydrate (Palmer 2009) in a protein binder. On the side edges of the crossbar, and on the underside, bright red and blue wool fibers are visible mixed into the ground, presumably as a bulking agent, and they recall the mixture of plaster and wool fibers found in Pietro Torrigiano's portrait bust of King Henry VII, dating from around 1509–1511 (Galvin and Lindley 1988, p. 897).

Polarized light microscopy and X-ray fluorescence were used to characterize the polychromy, which was applied after the bole and gilding. The blue lining of the Madonna's cloak and veil is composed primarily of azurite with a few grains of carbon black and some unidentified white particles. The red on the Madonna's right sleeve is vermilion, and that on the figures' lips is a mixture of vermilion and red lead (Berrie 2007). The flesh tone is composed of lead white with particles of red lead and some carbon black (Palmer 2009).

The analyses revealed materials consistent with what would be expected for Renaissance sculpture, but their combinations suggest experimentation by the artist.

### The Inscription

In all previous discussions of this work, the inscription was never formally addressed, and in fact it was even incorrectly published as reading “AVE MARIA GRATIA PLENA” (Goldscheider 1949, p. 152; Ragghianti 1965; Middeldorf 1976, pp. 13–14; Bellini 1977, p. 182, n. 4), when in

fact it reads “AVE MARIA GRAZIA PRENA” (Fig. 6). The presumed misspelling inevitably raises a number of questions: Was the use of *prena* rather than *plena* intentional? Was it intended as a play on words? Could the inscription be a later addition? Infrared reflectography revealed no modifications or additional markings in the area.

Explanations exist for the variance in spelling that do not call into question the originality of the inscription or the authenticity of the sculpture. The linguistic phenomenon of rhotacism, for example, by which the letter *r* replaces another consonant, occurs in several languages. In Italian and its dialects, primarily in central and northern regions, it is common to find words in which the letter *l* has been replaced by *r* in everyday speech (Guazzelli 2008), and numerous examples exist in letters, documents, notebooks, and reference materials. For instance, this is found in a note by Jacopo della Quercia dated February 1434 (Bellini and Fineschi 1975), in Giambologna's notebooks a century later (Codini and Sbrilli 1996), and in various 19th- and 20th-century Italian and dialectal dictionaries. The presence of *prena* rather than the more familiar *plena* appears to be the result of the common exchange of these letters in the vernacular, rather than an error.

Another possible explanation is that the exchange was wholly intentional as a play on words. *Pregna* in Italian means “pregnant” or “full”; the *prena* in the sculpture's inscription would recall *pregna* and thus be an allusion to the Annunciation. This interpretation is reinforced by the

presence of the word *prena* in the inscription at the bottom of Neri di Bicci's *Annunciation* in the Church of Santa Trinita in Florence, which seems intended to emphasize the scene depicted in the fresco.

Anna Jolly espouses a similar explanation, adding: "It is possible that many of these images were, as Geraldine Johnson proposes [Johnson 1997, pp. 8–9], made to work in conjunction with ideas about pregnancy and childbirth. Popular belief stressed that pregnant women, if they looked upon images of beautiful children, would themselves be more likely to produce comely offspring. And perhaps the insertion of *prena* subtly reminded women of the importance of viewing images of beautiful children" (Jolly 2007).

Each hypothesis has merit and further contributes to the interpretation of the Kress Madonna. The anomalous inscription should not be considered a mistake, nor should it diminish the viewer's appreciation of the sculpture.

### Conclusion

Richard Krautheimer once wrote, in reference to the multitude of Madonna and Child sculptures from the early 15th century, "To unravel the problem calls for a renewed study from the very outset" (Krautheimer 1956, p. 203, n. 2). By looking beyond the stylistic features, at the materials and construction method used, the current project aims to provide new insights on the work and to contribute to unraveling the problem of attribution. Although this specific question remains unanswered, several important additions to the body of knowledge have been made.

With the authenticity of the work confirmed, it was possible to contemplate the rationale for the uncommon spelling in the inscription. A number of explanations were presented for the variance that do not diminish its significance, and may actually enhance the value of the inscription. The numerous and varied components of the hand-modeled sculpture's structure were identified and determined to be original. Furthermore, it was established that the backing is not only original to the work rather than a later addition, but is also part of the artist's fundamental conception of the work.

The materials are absolutely consistent with what is expected for Renaissance polychrome sculpture. Their unusual combination, however, is in stark contrast with the tendency of 15th-century workshops to economize in

time and materials in the large-scale production of this popular genre. The deliberate choice of materials, construction technique, and decoration for the Kress Madonna required forethought and planning, and indicates an all but time-saving process. Furthermore, it confirms the belief that this sculpture is truly extraordinary. Though many questions remain regarding the origin of the sculpture, the clues uncovered during the treatment and technical investigation, such as the painted hatch marks in the flesh-toned portions of the figures, will contribute to the unraveling of the question of the attribution of the Kress Madonna.

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### Materials

Surfonic JL-80N is a non-ionic surfactant produced by Huntsman Performance Products, The Woodlands, Texas.

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In notes from her visit of August 21, 1997, Christine Sperling (Bloomsburg University) mentions the different spelling in the inscription but does not propose an explanation. Alison Luchs draws a comparison with Venetian Quattrocento inscriptions where *R* and *L* are exchanged.

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